

Amendments to the Drawings:

The attached sheet of drawings includes changes to Fig. 4. This sheet, which includes insertion of a new step designated by reference numeral 105, replaces the original sheet Fig. 4.

Attachment: Replacement Sheet
Annotated Sheet Showing Changes

Remarks/Arguments

Figure 4 and the corresponding section of the description are amended to include a new step designated by reference numeral 105. Step 105 shows determining the average current drain of the batteries during usage, as requested by the Examiner.

By these amendments, claims 1 and 5 are amended, claim 3 is cancelled and new claims 7 to 15 are added, as shown in the claim listing attached hereto. The amendments to claim 1 are directed primarily to introducing the limitations of claim 3, as well as rearranging some of the terms for improved clarity. The amendments to claim 5 are made for improved clarity. New claims 7 to 9 depend on independent claim 4 and are directed to selected limitations drawn from original claims 5 and 6.

New independent claim 10 presented herewith comprises limitations drawn from a combination of original claims 1 and 2. New claim 11 finds support in paragraph 32, page 7 of the application as filed. New claim 12 finds support in paragraph 22, page 5 of the application as filed. New claim 13 is based on original claim 3. New claims 14 to 16 find support in paragraph 1, page 1 of the application as filed.

In the Office Action, the Examiner rejects claim 1 as being anticipated by U.S. 5,717,309 to Cho (hereinafter "Cho"). Cho discloses a charging device that can either charge one battery quickly or charge two batteries simultaneously at a normal speed. According to Cho, if two batteries are being charged simultaneously, each battery receives current according to the same voltage supplied at both charging ports. Cho does not disclose or suggest allocating charging currents to separate charging ports. Further, Cho does not disclose or suggest any control circuitry or other means for allocating such charging currents. Instead, Cho merely provides the same voltage to the two batteries across the respective FETs (FET616 and FET619).

Further, Cho does not disclose or suggest allocating the charging currents so that the rechargeable batteries will be fully charged at substantially the same time. Rather, Cho merely charges the two batteries at the same time and at a normal speed. Cho does not take account of differing charge levels remaining in the rechargeable batteries and therefore there is no need for allocating the charging currents to the separate charging ports. This is also because Cho does not advert to the specific purpose of having the rechargeable batteries reach full charge at substantially the same time. Accordingly, it is submitted that Cho does not teach or suggest all of the features of claim 1 and that Cho therefore does not anticipate claim 1.

The Examiner also rejects claims 1, 2 and 4 as being anticipated by U.S. 6,424,119 to Nelson et al. (hereinafter "Nelson"). Nelson relates to a system for controlling multiple energy storage devices in an uninterruptible power supply (UPS). The system includes a multiple battery charger coupled to a direct current (DC) bus of the UPS system and two or more energy storage circuits. As shown in Fig. 4 and stated at column 3, lines 24-36, multiple battery charger 70 has two or more energy storage circuits on separate modules 72a, 72b and 72c. Each module has a charger 74. Apparently, one charger can be used to provide charging current to all modules.

Nelson discloses use of a regulator 76 in each module for controlling current flow to the energy storage device 78 in that module. Nelson does not disclose or suggest a regulator that controls allocation of currents to two separate batteries. Further, Nelson does not disclose that charger 74 is capable of performing any allocation of current to separate batteries. Rather, Nelson implies that if charger 74 is to be used to provide charging current to all modules, this is done by merely providing the charging current over the DC bus 73. Nelson does not disclose or suggest any way of allocating current to separate batteries from a single current source. Rather, Nelson operates in a similar manner to Cho, in that the same current source is applied without specific allocation to the multiple batteries. Further, Nelson does not disclose allocating charging currents so that the two or more batteries become fully charged at substantially the same time.

Further, Nelson does not disclose or suggest determining the charging currents to be allocated to the charging ports based at least in part on an average current drain during usage of the respective rechargeable battery coupled to each port.

Further, Nelson does not disclose or suggest the determination of relative amounts of charge required to fully charge the batteries. This is because each regulator 76 is purely concerned with controlling flow to the battery on the module on which that regulator resides. Accordingly, the only device disclosed by Nelson as being suitable for controlling current flow to a battery, namely regulator 76, is dedicated purely to providing current to that particular battery and is not disclosed as being able to allocate charging currents to any other battery or determine relative amounts of charge required to fully charge more than one battery. Further, Nelson does not disclose or suggest that processor 80 can perform any of the allocating or determining steps of claims 1 and 2. Instead, Nelson teaches a single regulator 76 on each module for controlling current to the battery on the respective module.

The Examiner asserts that it is an inherent function of the apparatus disclosed by Nelson to continuously monitor the relative amounts of charge required to fully charge the two or more rechargeable batteries, because Nelson discloses that each module has a processor 80. Applicants respectfully disagree. In order for a processor, such as processor 80 of Nelson, to continuously monitor the relative amounts of charge required to fully charge a battery, the processor must be specifically programmed to do so and must have appropriate software executing thereon and appropriate input and output circuiting and terminals configured for such a purpose. Such software and hardware functionality is not inherent in any processor. In order to have such functionality, the processor must be specifically designed for it.

The Examiner further asserts that, in relation to claim 4, Nelson discloses "a current allocator 76 to allocate charging currents from said current source to said two or more ports [and] a controller 82 to determine said charging currents so that two or more rechargeable batteries coupled respectively to said two or more ports will be

fully charged at substantially the same time". However, the component designated by reference numeral 76 in Fig. 4 of Nelson is a power regulator that controls power flow to and from the energy storage device 78 (battery) of the module on which the power regulator 76 is located. Power regulator 76 is not a current allocator in the manner claimed in claim 4 as it does not allocate currents from a single current source to separate charging ports. Further, power regulator 76 cannot allocate charging currents from a single current source to two or more batteries as it is dedicated to controlling power flow to and from a single battery. Additionally, controller 82 is disclosed by Nelson as being a CAN controller for adapting the communication protocol used by the processor to be communicated to the other processors (column 3, lines 41 to 44). Nelson does not disclose or suggest that controller 82 can be used to determine charging currents for allocation by the current allocator from a single current source so that the two or more rechargeable batteries become fully charged at substantially the same time.

Regarding claim 4, Nelson does not disclose or suggest a current allocator that can allocate charging currents from a single current source to two or more ports. As mentioned above, Nelson describes separate regulators for each battery. Further, Nelson does not disclose or suggest a controller that can determine how to allocate the charging currents for the separate batteries so that they will be fully charged at substantially the same time. Nelson discloses a processor 80, but that processor is not disclosed as being able to determine charging currents so that the ports to which the separate charging currents are allocated will charge the batteries to be fully charged at the substantially the same time. Rather, processor 80 is only disclosed as being a separate processor for each module and as only controlling the one regulator 76 on that module. It is therefore submitted that Nelson does not disclose or suggest all of the features of any of claims 1, 2 and 4 and that Nelson therefore does not anticipate any of those claims.

The Examiner rejects claim 3 for obviousness over Nelson in view of "Smart Battery Data Specification" (hereinafter "Smart Battery"). As claim 3 is cancelled, this rejection is rendered moot.

The Examiner rejects claims 5 and 6 for obviousness over Nelson in view of Smart Battery and further in view of DE4200693 (hereinafter "DE").

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or combine reference teachings. Second, there must be some reasonable expectation of success. Finally, the prior art references must teach or suggest all of the claim limitations. The teaching or suggestions to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in the Applicant's disclosure.

With respect to the Examiner's rejection of claims 5 and 6 as being obvious over Nelson and Smart Battery in view of DE, it is respectfully submitted that none of the cited references provide the necessary motivation to combine Nelson with Smart Battery and DE to arrive at the invention defined in claims 5 and 6.

Furthermore, for the reasons described above in relation to claims 1, 2 and 4, Nelson fails to teach or suggest all of the claim limitations and therefore the combination of Nelson, Smart Battery and DE cannot teach or suggest all of the claim limitations.

Further, DE only discloses a table correlating voltage and temperature with discrete time levels. The lookup table of DE cannot be used to determine an amount of charge required to fully charge a battery based on measured voltage differences, the battery type and the average current drain of the battery during usage, nor are such limitations disclosed or suggested in Nelson or Smart Battery. Accordingly, the combination of Nelson, Smart Battery and DE fails to teach or suggest all of the claim limitations of claims 5 and 6.

It is noted that, under her rejection of claim 3, at point 6 of the Office Action, the Examiner asserts that "at least in part on an average current drain during usage" is indefinite. In this regard, Applicants ask the Examiner to please note paragraph

23, page 5 of the application as filed, where it is described that charging circuitry 7 may obtain the battery type identification from battery 5 and pass the information to controller 32, which uses one or more lookup tables to determine information based on the battery type. Such information may include, for example, the maximum charge capacity, the average current drain from the battery during usage and the estimated relationship between the output voltage of the battery and the unused capacity of the battery. Accordingly, information such as the average current drain from the battery during usage is predetermined and is used by the controller as one parameter for charging batteries of the appropriate type.

New claims 7 to 16 include limitations that patentably distinguish from the cited references for the reasons described above, either by virtue of their dependency on claims that are submitted to be allowable or by virtue of reciting patentably distinguishing limitations, or both.

In view of the foregoing amendments and remarks, Applicants respectfully submits that the application is in condition for allowance. Applicant respectfully requests that a timely Notice of Allowance be issued in this case.

Respectfully submitted,

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Annotated Sheet Showing Changes

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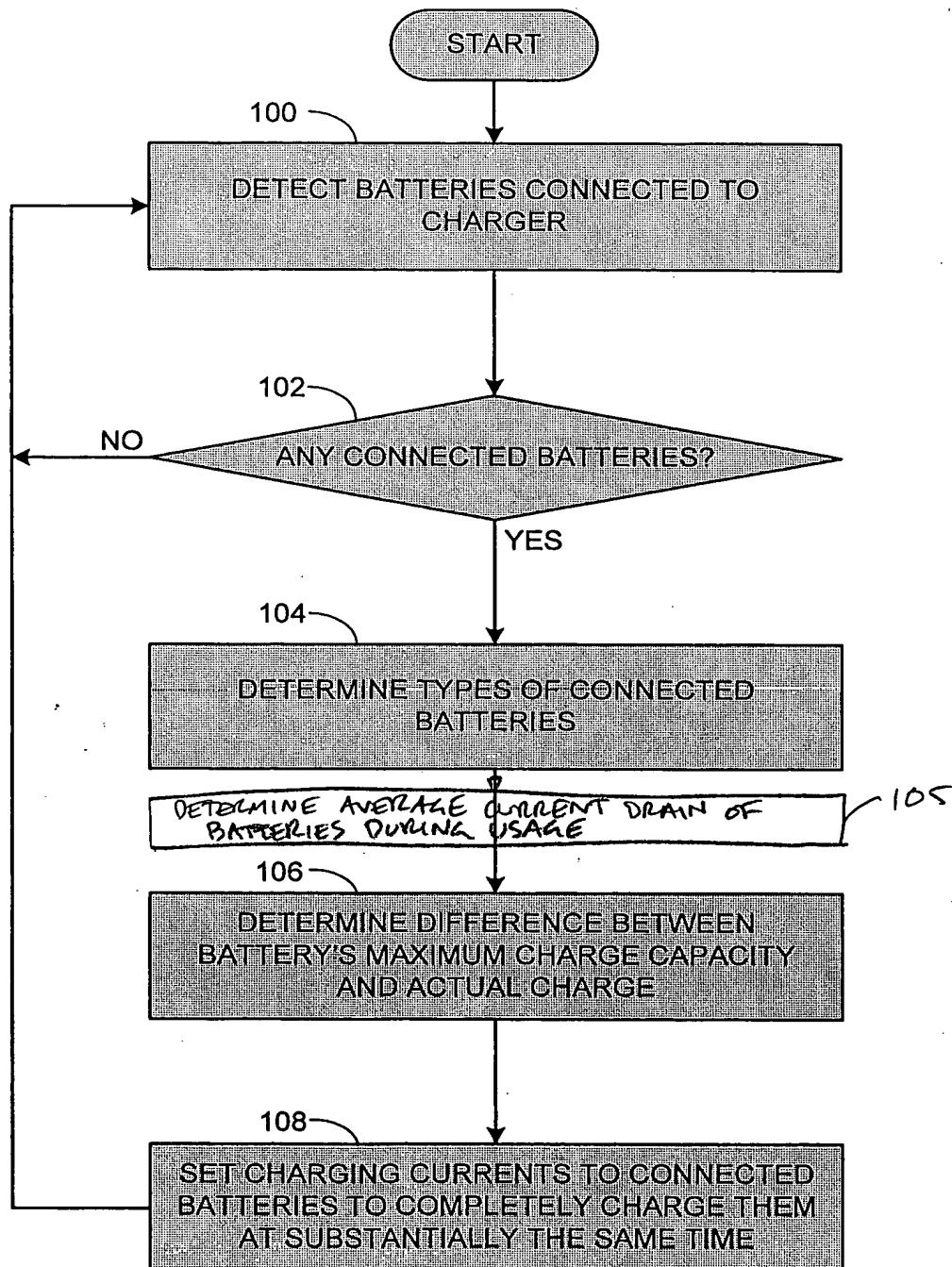


FIG. 4